

**B.Sc. Semester-VI Examination, 2022-23****ELECTRONICS [Honours]**

Course ID : 61717 Course Code : SH/ELC/604/DSE-4(T)

Course Title : Control Systems

Time : 1 Hour 15 Minutes

Full Marks : 25

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*1. Answer any **three** of the following questions:

1×3=3

- What is an automatic control system?
- Give the block diagram of open-loop control system.
- Name two parameters on which the performance of a closed-loop control system depend.
- What is Phase Margin?
- Give two basic differences between open-loop and closed-loop control systems.
- Name the various types of error detectors in control system.

*[Turn over]*2. Answer any **three** of the following questions:

2×3=6

- Give the block diagram for a closed-loop control system.
- Draw a block diagram of a Servo Mechanical System, whose function is to position a load.
- What is Nyquist plot?
- Define how the bandwidth changes the performance of a closed-loop control system.
- What is System Stability? How is it determined?
- What is the system equation for a First-Order Servo Mechanism system?

3. Answer any **two** of the following questions:

5×2=10

- Draw the basic elements of a servo system/servo mechanism. Explain the function of each block.  
2+3=5
- Draw the circuit diagram of a potentiometer error detector. Obtain the Laplace Transformation of the error signal for this case. Hence give the block diagram of a servo system (closed-loop control system) which represents the earlier equation.  
2+3=5

c) In terms of sensitivity, a closed-loop control system is far better than open-loop control system.– Establish this statement. 5

d) If the Laplace Transformation of a unit step function is  $1/s$  then considering it as input obtain the system equation. Plot the graph of it.

$$4+1=5$$

4. Answer any **one** of the following questions:

$$6 \times 1 = 6$$

a) Draw the block diagram of a first order servo control system. Obtain the transfer function  $T(s)$  for it and draw the simplified block diagram. Now show that, physically this system represents an RC circuit. 2+2+2=6

b) Find the Transfer function of the LRC circuit when output is taken across the capacitor (C). Draw the simplified block diagram. Consider time constant;  $T_1 = L/R$  and  $T_2 = CR$ .

$$4+2=6$$

c) What is the technique of finding stability of a servo control system (closed-loop control system)? Is this technique valid for all orders of the system equation? Give reasons in support of your answer. 4+2=6